

## Study of Etiological Profile of Neonatal Sepsis in a Tertiary Care Hospital: SMS Medical College, Jaipur

Dr. Gayatri Dhangar<sup>1\*</sup>, Dr. Garima Goyal<sup>2</sup>, Dr. Richa Choudhary<sup>3</sup>

<sup>1,3</sup>Assistant Professor, Department of Pediatrics, SMS Medical College, Jaipur, India

<sup>2</sup>Senior Resident, Department of Pediatrics, SMS Medical College, Jaipur, India

### Original Research Article

#### \*Corresponding author

Dr. Gayatri Dhangar

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**Abstract:** This study was conducted to know the prevalence and bacteriological profile of neonates admitted for suspected sepsis in a tertiary care hospital of Rajasthan. In the present study, 1054 neonates with signs and symptoms suggestive of sepsis, between the age of 1 to 28 days, clinically suspected to have sepsis admitted in neonatal intensive care unit (NICU) were included. The blood samples were processed to diagnose septicemia. Identification of bacterial isolates and disc susceptibility testing were performed using standard techniques. Blood culture was positive in 132 (12.52%) cases. Gram positive bacteria 70(53.03%) were responsible for most cases of neonatal sepsis as compared to gram negative bacteria 57 (43.18%). Candida was found in 5(3.79%) patients. An overall neonatal septicemia prevalence rate of 12.52% was observed. Enterococcus species was the predominant microorganism causing neonatal septicemia in our setting. It is necessary to have a continuing surveillance of NICUs so as to be aware of the common pathogens that cause septicemia and their susceptibility to commonly used antimicrobial agents. This knowledge will guide clinicians on the appropriate use of antimicrobial agents.

**Keywords:** neonatal sepsis, bacteriological profile.

### INTRODUCTION

Sepsis is one of the major causes of neonatal morbidity and mortality [1]. Early signs and symptoms of infection are very nonspecific and can often be misinterpreted. The clinical course can be fulminant, leading to septic shock, disseminated intravascular coagulation, and death within hours of initial clinical symptoms [2].

Neonatal sepsis (NNS) is caused by a variety of gram-positive and negative bacteria. Institutional and regional differences in the types of pathogens and severity of NNS have been documented [3-7]. Differences in organisms have been noted between early and late-onset sepsis [8, 9]. Furthermore, the epidemiology of neonatal sepsis within the same geographical locations may vary with time [10-12]. Several reports have implicated commensal species such as coagulase-negative staphylococci (CONS) and candida albicans, as a significant cause of neonatal infections. The increasing incidence of sepsis in NICUs has been attributed to the increased use of invasive procedures such as central venous catheters, intravenous nutrition, and overcrowding and staff shortage [13-19]. Therefore, it is necessary to have a continuing surveillance of NICUs so as to be aware of the common pathogens that cause septicemia and their sensitivity to commonly used antimicrobial agents. This knowledge should guide clinicians on the rational use of antimicrobial agents. Against this background, we conducted this study to determine the prevalence

and etiologic agent of neonatal septicemia in our setting.

### PATIENTS AND METHODS

#### Patients

1054 neonates who were admitted to the neonatal unit of Sir Padampat Mother and Child Health Institute attached with SMS Medical College, Jaipur for suspected sepsis from May 1 to December 31, 2017 were studied prospectively. The inclusion criteria included: (i) clinical evidence suggestive of sepsis, e.g. lethargy, feed intolerance, unexplained metabolic acidosis, unexplained respiratory distress, jaundice, thermal instability or glucose homeostasis, apnea, bradycardia, mottling of skin and (ii) hematologic evidence of sepsis, namely thrombocytopenia, neutropenia or an elevated fraction of immature to total neutrophils using the criteria of Manroe *et al.* [20] (iii) a diagnosis of sepsis confirmed by a positive blood culture for a single organism. Multiple positive blood cultures in the same infant, which grew the same species with the same antibiotic susceptibilities, were

considered as a single case. Neonatal patient with congenital malformations and known chromosomal disorders were excluded from study. After samples for the relevant investigations had been obtained, each infant suspected of having septicemia were given combination of antibiotics. Initial antibiotics were ampicillin and gentamicin. This initial therapy was modified when culture results and their sensitivity patterns were available.

**Blood Samples**

From each neonate, a blood sample was drawn by venipuncture for the various tests under all aseptic precautions. The samples for culture were taken before the first shot of antibiotic and for other samples it was made sure that no more than two doses of antibiotics were given.

**Bacteriological Examination**

1 ml of peripheral blood was taken under all aseptic precautions in blood culture bottles (McCartney Bottles) containing 5 ml of Brain Heart Infusion (BHI) broth. The blood culture bottles were incubated at 37°C over night aerobically. Primary subcultures were

done after 24 hours of incubation on to blood agar and Mac-Conkey agar. If there was no growth on plates, then bottles were incubated further and followed up by examining the broth daily and doing a final subculture at the end of day 7 or at appearance of turbidity, discrete colonies on surface of sedimented red cells or haemolysis whichever is earlier. The positive growth were identified by conventional methods according to standard laboratory protocol, including colony morphology, gram staining and biochemical reactions. After identification of bacteria, antimicrobial sensitivity testing was done.

**STATISTICAL ANALYSIS**

Data was entered in excel sheet to prepare master chart and was transported to statistical software for analysis. Statistical analysis was performed with the SPSS, Version 20 for Windows statistical software package (SPSS inc., Chicago, IL, USA) and primer. The categorical data was presented as numbers (percent).

**RESULTS**

**Table-1: Distribution of total cases**

Variable	No (% , N= 1054)
<b>Sex</b>	
Male	804 (76.28%)
Female	250 (23.72%)
Total	1054 (100%)
<b>Type of septicemia</b>	
EOS	763(72.39%)
LOS	291(27.61%)
Total	1054(100%)
<b>Type of isolates</b>	
	132
Gram positive	70 (6.64%)
Gram negative	57 (5.41%)
Candida	5 (0.47%)
No isolates	922(87.48%)
Total	1054(100%)

In the present study out of 1054 clinically suspected neonatal septicemia cases, 804 (76.28%) were males and 250 (23.72%) were female while 763(72.39%) were Early Onset Septicemia (EOS) and 291(27.61%) were Late Onset Septicemia (LOS). In

present study 70 (6.64%) were gram positive and 57 (5.41%) were gram negative isolates while in 922(87.48%) cases no isolates has been identified [Table 1].

**Table-2: Bacteria isolated in neonatal septicemia**

Acinetobacter	4(3.03%)
Candida	5(3.79%)
Citro bacter	13(9.85%)
CONS	25(18.94%)
COPS	17(12.88%)
E Coli	10(7.58%)
Enterobacter	11(8.33%)
Enterococcus	28 (21.21%)
Klebsiella	12 (9.09%)
Proteus	3(2.27%)
Pseudomonas	4(3.03%)

Out of the 1054 cases up cases 132(12.52%) were blood culture positive. Gram positive bacteria 70(53.03%) were responsible for most cases of neonatal sepsis as compared to gram negative bacteria 57 (43.18%). *Candida* was found in 5(3.79%) patients. An overall neonatal septicemia prevalence rate of 12.52% was observed. *Enterococcus* species was the predominant microorganism causing neonatal septicemia in our setting [Table 2].

## DISCUSSION

In our study, sepsis was more common in males (76.28%) as compared to females (23.72%) as shown in [Table-1]. Aletayeb S *et al.* [21], Celicia C *et al.* [22], Rabia S *et al.* [23] and Ahmad A *et al.* [24] have reported higher sepsis in males as compared to female which correlates with our study. Male predominance could be due to gender biased care for male babies in our country[25].

In our study blood culture positive cases were 12.52. According to the National Neonatology Prenatal Database the incidence of culture proven sepsis is 8.5/1000 births, Genel *et al.* did a study of 84 neonates for suspected infection. They divided the neonates into infection and non-infection groups according to their clinical and laboratory findings. Eventually the infected group consisted of 49 neonates of whom 20 were found to be blood culture positive 40.8% [26]. Thus, the blood culture detection rate in our study was lower (12.52%) to that found in this study. Sathya murthy, KV Leela *et al.* in their scholarly article "Clinical and Bacteriological Profile of Neonatal Sepsis" reported a culture positivity of 35.9%[27].

In our study Gram negative isolates accounted for 57 cases (43.18%), Gram positive isolates accounted for 70 cases (53.03%), while *Candida* accounted for 5 cases (3.79%). On the other hand Merchant *et al.* Found that gram positive organisms accounted for majority of neonatal sepsis 70% as against 20% gram negative [28]. Venkateshesan Sundaram *et al.* in a retrospective study of isolates from a tertiary care Neonatal unit in Northern India reported that for many years gram negative bacteria were isolated from majority of bacteremic neonates with sepsis[29]. The proportion of cases with gram positive infection has steadily increased over the last decade. *CONS* and *Enterococcus* account for approximately 30 -50%. Various studies have shown culture positivity incidence from 8% - 73% [10-12].

*Enterococcus* is the most common organism causing neonatal sepsis in our study followed by coagulase negative and coagulase positive staphylococcus. Sathya murthy, KV Leela *et al.* in their scholarly article "Clinical and Bacteriological Profile of Neonatal Sepsis" found *Klebsiella* (37.06%) was the most common organism isolated followed by

staphylococcus aureus 18.8% and *Acinetobacter* 14.68%[27].

All the above studies indicate that organisms causing neonatal sepsis vary from NICU to NICU. Each NICU should have its own culture and sensitivity patterns. This will go a long way in avoiding irrational drugs and help in reducing antibiotic resistance.

## CONCLUSION

The results emphasized the importance of continuous evaluation of local antibiotic sensitivity patterns of pathogens of neonatal sepsis in the formulation of rational antibiotic policy. Prevalence of septicemia was 12.52% (0-28days) in present study and was higher in males compared to females. Among neonates, incidence of early onset septicemia was 72.39% and late onset septicemia was 27.61%. Common bacterial species isolated were *enterococcus* (20.45%) in neonates.

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## Ethical approval

The study was approved by the Institutional Ethics Committee.

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